

CLAIMS

1. (Previously Presented) A stable colloidal suspension comprising: (a) a dispersed phase comprising a major amount of one or more dispersed hydrated polymeric compounds selected from the group consisting of polymolybdates, polytungstates, polyvanadates, polyniobates, polytantalates, polyuranates, and mixtures thereof; and, (b) an oil phase comprising one or more dispersing agents and a diluent oil, wherein the stable colloidal suspension is substantially clear.

2. (Original) The colloidal suspension of Claim 1, wherein the dispersed hydrated polymeric compound is a dispersed hydrated polymolybdate.

3. (Original) The colloidal suspension of Claim 1, wherein the polymeric compound further comprises an alkali metal selected from the group consisting of lithium, sodium, potassium and rubidium.

4. (Original) The colloidal suspension of Claim 3, wherein the alkali metal polymeric compound is sodium polymolybdate.

5. (Original) The colloidal suspension of Claim 1, wherein the polymeric compound further comprises magnesium, calcium, ammonium or thallium.

6. (Original) The colloidal suspension of Claim 1, wherein the polymeric compounds are selected from the group consisting of isopolymolybdates, isopolytungstates, isopolyvanadates, isopolyniobates, isopolytantalates, isopolyurantes, heteropolymolybdates, heteropolytungstates, heteropolyvanadates, heteropolyniobates, heteropolytantalates, and heteropolyurantes.

7. (Original) The colloidal suspension of Claim 1, wherein the major amount of the dispersed hydrated polymeric compounds is from about 50 wt. % to about 100 wt. % of the dispersed phase.

8. (Original) The colloidal suspension of Claim 1, wherein the major amount of the dispersed hydrated polymeric compounds is from about 60 wt. % to about 95 wt. % of the dispersed phase.

9. (Previously Presented) The colloidal suspension of Claim 1, having a turbidity of less than about 300 nephelometric turbidity units (ntu).

10. (Original) The colloidal suspension of Claim 1, wherein the dispersed hydrated polymeric compound possesses a mean particle size less than about 1 micron.

11. (Original) The colloidal suspension of Claim 1, wherein the dispersed hydrated polymeric compound possesses a mean particle size of about 0.01 microns to about 0.5 microns.

12. (Original) The colloidal suspension of Claim 1, wherein the dispersing agent is selected from the group consisting of polyalkylene succinic anhydrides, non-nitrogen containing derivatives of a polyalkylene succinic anhydride and mixtures thereof.

13. (Original) The colloidal suspension of Claim 12, wherein the polyalkylene succinic anhydride is a polyisobutylene succinic anhydride.

14. (Original) The colloidal suspension of Claim 1, wherein the oil phase further comprises a detergent.

15. (Original) The colloidal suspension of Claim 14, wherein the detergent is a metal sulfonate.

16. (Original) The colloidal suspension of Claim 15, wherein the metal sulfonate is a low overbased metal or neutral metal sulfonate.

17. (Original) The colloidal suspension of Claim 15, wherein the metal sulfonate is a calcium sulfonate.

18. (Previously Presented) A process for preparing a stable colloidal suspension comprising:

mixing, under agitation, (a) an aqueous solution comprising one or more hydrated polymeric compounds selected from the group consisting of polymolybdates, polytungstates, polyvanadates, polyniobates, polytantallates, polyuranates, and mixtures thereof; (b) one or more dispersing agents and (c) a diluent oil to form a micro emulsion; and,

heating the micro emulsion to a temperature to remove sufficient water so as to produce a stable colloidal suspension comprising (a) a dispersed phase comprising a major amount of one or more dispersed hydrated polymeric compounds selected from the group consisting of polymolybdates, polytungstates, polyvanadates, polyniobates, polytantallates, polyuranates, and mixtures thereof; and, (b) an oil phase comprising the dispersing agent and the diluent oil, wherein the stable colloidal suspension is substantially clear.

19. (Original) The process of Claim 18, wherein the polymeric compound is a polymolybdate.

20. (Original) The process of Claim 18, wherein the polymeric compound further comprises an alkali metal selected from the group consisting of lithium, sodium, potassium and rubidium.

21. (Original) The process of Claim 20, wherein the alkali metal polymeric compound is sodium polymolybdate.

22. (Original) The process of Claim 18, wherein the polymeric compound further comprises magnesium, calcium, ammonium or thallium.

23. (Original) The process of Claim 18, wherein the polymeric compounds are selected from the group consisting of isopolymolybdates, isopolytungstates, isopolyvanadates, isopolyniobates, isopolytantalates, isopolyuranates, heteropolymolybdates, heteropolytungstates, heteropolyvanadates, heteropolyniobates, heteropolytantalates, and heteropolyuranates.

24. (Original) The process of Claim 18, wherein the dispersing agent is selected from the group consisting of polyalkylene succinic anhydrides, non-nitrogen containing derivatives of a polyalkylene succinic anhydride and mixtures thereof.

25. (Original) The process of Claim 24, wherein the polyalkylene succinic anhydride is a polyisobutylene succinic anhydride.

26. (Original) The process of Claim 18, wherein the step of mixing, under agitation, further comprises mixing a detergent.

27. (Original) The process of Claim 26, wherein the detergent is a metal sulfonate.

28. (Original) The process of Claim 27, wherein the metal sulfonate is a low overbased metal or neutral metal sulfonate.

29. (Original) The process of Claim 27, wherein the metal sulfonate is a calcium sulfonate.

30. (Previously Presented) The process of Claim 18, wherein the colloidal suspension has a turbidity of less than about 300 ntu.

31. (Original) The process of Claim 18, wherein the one or more dispersed hydrated polymeric compounds possess a mean particle size less than about 1 micron.

32. (Original) The process of Claim 18, wherein the one or more dispersed hydrated polymeric compounds possess a mean particle size of about 0.01 microns to about 0.5 microns.

33. (Original) The process of Claim 18, wherein the major amount of the dispersed hydrated polymeric compounds is from about 50 wt. % to about 100 wt. % of the dispersed phase.

34. (Original) The process of Claim 18, wherein the major amount of the dispersed hydrated polymeric compounds is from about 60 wt. % to about 95 wt. % of the dispersed phase.

35. (Original) A lubricant composition comprising a major amount of an oil of lubricating viscosity and a minor effective amount of the stable colloidal suspension of Claim 1.

36. (Original) A lubricant composition comprising a major amount of an oil of lubricating viscosity and a minor effective amount of the stable colloidal suspension of Claim 4.

37. (Original) A lubricant composition comprising a major amount of an oil of lubricating viscosity and a minor effective amount of the stable colloidal suspension of Claim 7.

38. (Original) A lubricant composition comprising a major amount of an oil of lubricating viscosity and a minor effective amount of the stable colloidal suspension of Claim 12.

39. (Original) A lubricant composition comprising major amount of an oil of lubricating viscosity and a minor effective amount of the stable colloidal suspension of Claim 14.

40. (Original) An additive package comprising about 10 to about 75 weight percent of the stable colloidal suspension of Claim 1.

41. (Original) The additive package of Claim 40 further comprising one or more of additives selected from the group consisting of ashless dispersants, detergents, sulfurized hydrocarbons, dialkyl hydrogen phosphates, zinc dithiophosphates, polyol esters of fatty acids, 2,5-dimercaptothiadiazole, benzotriazole, molybdenum sulfide complexes, imidazolines, and foam inhibitors.

42. (Original) An additive package comprising about 10 to about 75 weight percent of the stable colloidal suspension of Claim 7.

43. (Previously Presented) A process for preparing a stable colloidal suspension comprising:

mixing, under agitation, an (a) aqueous solution comprising (i) one or more monomeric compounds selected from the group consisting of molybdenum, tungsten, and vanadium containing compounds and (ii) an effective amount of an acid capable of at least partially polymerizing the one or more monomeric compounds; (b) one or more dispersing agents and (c) a diluent oil to form a micro emulsion; and,

heating the micro emulsion to a temperature to remove sufficient water so as to produce a stable colloidal suspension comprising (a) a dispersed phase comprising a major amount of one or more dispersed hydrated polymeric compounds selected from the group consisting of polymolybdates, polytungstates and polyvanadates; and, (b) an oil phase comprising the dispersing agent and the diluent oil, wherein the stable colloidal suspension is substantially clear.

44. (Original) The process of Claim 43, wherein the monomeric compound is a monomeric molybdenum containing compound.

45. (Original) The process of Claim 43, wherein the aqueous solution in the step of mixing, under agitation, further comprises a hydroxide selected from the group consisting of alkali metal hydroxides, alkaline earth metal hydroxides, ammonium hydroxide and thallium hydroxide.

46. (Original) The process of Claim 45, wherein the alkali metal hydroxide is selected from the group consisting of lithium hydroxide, sodium hydroxide, potassium hydroxide and rubidium hydroxide.

47. (Original) The process of Claim 45, wherein the alkaline earth metal hydroxide is magnesium hydroxide.

48. (Original) The process of Claim 43, wherein the acid is selected from the group consisting of nitric acid, sulfuric acid, carbonic acid, phosphoric acid, pyrophosphoric acid, silicic acid, boric acid and mixtures thereof.

49. (Original) The process of Claim 43, wherein the one or more monomeric compounds selected from the group consisting of molybdenum, tungsten, and vanadium containing compounds further comprise an alkali metal.

50. (Original) The process of Claim 49, wherein the alkali metal is selected from the group consisting of lithium, sodium, potassium and rubidium.

51. (Original) The process of Claim 43, wherein the dispersed hydrated polymeric compounds are selected from the group consisting of isopolyniobates, isopolytantalates, isopolyuranates, heteropolyniobates, heteropolytantalates, and heteropolyuranates.

52. (Original) The process of Claim 43, wherein the dispersing agent is selected from the group consisting of polyalkylene succinic anhydrides, non-nitrogen containing derivatives of a polyalkylene succinic anhydride and mixtures thereof.

53. (Original) The process of Claim 52, wherein the polyalkylene succinic anhydride is a polyisobutylene succinic anhydride.

54. (Original) The process of Claim 43, wherein the step of mixing, under agitation, further comprises mixing a detergent.

55. (Original) The process of Claim 54, wherein the detergent is a metal sulfonate.

56. (Original) The method of Claim 55, wherein the metal sulfonate is a low overbased metal or neutral metal sulfonate.

57. (Original) The process of Claim 55, wherein the metal sulfonate is a calcium sulfonate.

58. (Original) The process of Claim 43, wherein the one or more dispersed hydrated polymeric compounds possess a mean particle size less than about 1 micron.

59. (Original) The process of Claim 43, wherein the one or more dispersed hydrated polymeric compounds possess a mean particle size of about 0.01 microns to about 0.5 microns.

60. (Original) The process of Claim 43, wherein the major amount of the dispersed hydrated polymeric compounds is from about 50 wt. % to about 100 wt. % of the dispersed phase.

61. (Original) The process of Claim 43, wherein the major amount of the dispersed hydrated polymeric compounds is from about 60 wt. % to about 95 wt. % of the dispersed phase.

62. (Previously Presented) The process of Claim 43, wherein the colloidal suspension has a turbidity of less than about 300 ntu.

63. (Previously Presented) A process for preparing a stable colloidal suspension comprising:

mixing, under agitation, (a) an aqueous solution comprising one or more monomeric compounds selected from the group consisting of niobium, tantalum, and uranium containing compounds; (b) one or more dispersing agents and (c) a diluent oil to form a micro emulsion; and,

heating the micro emulsion to a temperature to remove sufficient water so as to produce a stable colloidal suspension comprising (a) a dispersed phase comprising a major amount of a dispersed hydrated polymeric compound selected from the group consisting of polyniobates,

polytantalates, and polyuranates; and, (b) an oil phase comprising the dispersing agent and the diluent oil, wherein the stable colloidal suspension is substantially clear.

64. (Original) The process of Claim 63, wherein the aqueous solution in the step of mixing, under agitation, further comprises a hydroxide selected from the group consisting of alkali metal hydroxides, alkaline earth metal hydroxides, ammonium hydroxide and thallium hydroxide.

65. (Original) The process of Claim 63, wherein the alkali metal hydroxide is selected from the group consisting of lithium hydroxide, sodium hydroxide, potassium hydroxide and rubidium hydroxide.

66. (Original) The process of Claim 65, wherein the alkaline earth metal hydroxide is magnesium hydroxide.

67. (Original) The process of Claim 63, wherein the one or more monomeric compounds selected from the group consisting of niobium, tantalum, and uranium containing compounds further comprise an alkali metal.

68. (Original) The process of Claim 67, wherein the alkali metal is selected from the group consisting of lithium, sodium, potassium and rubidium.

69. (Original) The process of Claim 63, wherein the one or more dispersed hydrated polymeric compounds are selected from the group consisting of isopolyniobates, isopolytantalates, isopolyuranates, heteropolyniobates, heteropolytantalates, and heteropolyuranates.

70. (Original) The process of Claim 63, wherein the dispersing agent is selected from the group consisting of polyalkylene succinic anhydrides, non-nitrogen containing derivatives of a polyalkylene succinic anhydride and mixtures thereof.

71. (Original) The process of Claim 70, wherein the polyalkylene succinic anhydride is a polyisobutylene succinic anhydride.

72. (Original) The process of Claim 63, wherein in the step of mixing, under agitation further comprises a detergent.

73. (Original) The process of Claim 72, wherein the detergent is a metal sulfonate.

74. (Original) The process of Claim 73, wherein the metal sulfonate is a low overbased metal or neutral metal sulfonate.

75. (Original) The process of Claim 73, wherein the metal sulfonate is a calcium sulfonate.